

## Dioxin and Dioxin-Like Compounds

### *Chemical Information.*

“Dioxins” refers to a group of chemical compounds that share similar chemical and biological properties. These toxic compounds are members of closely related families: the chlorinated dibenzo-p-dioxins (CDDs) and chlorinated dibenzofurans (CDFs).

**General Uses** - CDDs and CDFs are not commercially produced except in small quantities for chemical analyses and toxicological research. CDDs and CDFs are formed as unwanted byproducts when chlorinated materials are involved in combustion or other high-temperature processes, such as waste incineration, energy generation, metallurgical processes, chemical manufacturing and other industrial processes. Energy generation sources of CDD/CDF releases include the combustion of coal, oil, and wood. Other high-temperature sources include Portland cement production, pulp mills using the kraft process, asphalt mixing plants, catalyst regeneration at petroleum refineries, and carbon reactivation furnaces. Metallurgical processes that may release CDD/CDFs include ferrous sources such as iron ore sintering, coke production, and the production of steel in electric arc furnaces from scrap feed. Secondary aluminum, copper, and lead smelters may also be sources of CDD/CDFs. CDDs and CDFs can also be formed as unintended byproducts of manufacturing processes. For example, they are generated in pulp and paper mills during chlorine bleaching.

**Potential Hazards** - Dioxins and furans can cause a number of health effects. The most well known member of the dioxins/furans family is 2,3,7,8 TCDD which is a known human carcinogen (National Toxicology Program -- NTP). Also, high doses of dioxin have caused a skin disease called chloracne.

### *Summary Analysis – Dioxin and dioxin-like compounds*

- Reporting for dioxins began in 2000. In 2003, the 700 pounds of dioxins accounted for less than 0.1 percent of the total quantity of PCs. There has been approximately a 17 percent decrease in the quantity of dioxins reported from 2000 to 2003. Much of the increase in 2003 was due to over 300 pounds of dioxins (contained in used telephone poles /wood wastes) reported by a wood preserving facility in Louisiana.
- In 2003, land disposal (60.0%) was the primary management method used for dioxins, followed by treatment (39.7%). These management method percentages are heavily influenced by the quantity reported by the Louisiana facility noted above. Previous to 2003, dioxins were managed primarily by treatment (90%), followed by disposal (less than 10%).
- Although 373 facilities reported dioxins in 2003, only 33 facilities accounted for 99 percent of the dioxins reported in 2003. Eight of these facilities accounted for over 89 percent of the total quantity of this chemical. One facility accounted for over 45 percent of the total dioxins quantity reported in 2003.
- Over 84 percent of the dioxins were reported by facilities in Regions 6. Facilities in 3 states (Louisiana, Texas, and Michigan) reported almost 93 percent of the PC quantity of dioxins in 2003. Facilities in Louisiana reported almost 65 percent of the total quantity.
- Facilities in SIC 2491 (Wood Preserving) and SIC 2869 (Industrial Organic chemicals, nec) reported the highest quantities.

*National Trends – Dioxin and dioxin-like compounds (Dioxins).* Exhibit 4.68 presents the total PC quantity (pounds) of dioxin and dioxin-like compounds (hereafter simply referred to as dioxins) in 2000 to 2003, showing the disposal, treatment, energy recovery, as well as recycling quantities. Please note that data for 1999 is not included because this chemical only was reported to TRI beginning in 2000. In 2003, the 700 pounds of dioxins accounted for less than 0.1 percent of the total quantity of PCs. There has been approximately a 17 percent decrease in the quantity of dioxins reported from 2000 to 2003. Much of the increase in 2003 was due to over 300 pounds of dioxins (contained in used telephone poles /wood wastes) reported by a wood preserving facility in Louisiana. This facility had reported much smaller quantities in previous years (2000-2002). In 2003, land disposal (60.0%) was the primary management method used for dioxins, followed by treatment (39.7%). These management method percentages are heavily influenced by the quantity reported by the Louisiana facility noted above. Previous to 2003, dioxins were managed primarily by treatment (90%), followed by disposal (less than 10%).

Exhibit 4. 68. National-Level Information for Dioxin and dioxin-like compounds (2000-2003)

	2000	2001	2002	2003	Percent Change (2000-2003)	Management Method -- Percent of Quantity of this Chemical in 2003
Number of Facilities*	377(39)	367(34)	364 (32)	373 (33)	-1.1% (-1.5%)	
Disposal Quantity (lbs.)	41	68	54	420	924.4%	60.0%
Energy Recovery Quantity (lbs.)	4	5	4	2	-50.0%	0.3%
Treatment Quantity (lbs.)	555	625	485	278	-49.9%	39.7%
Priority Chemical Quantity (lbs.) **	600	698	543	700	16.6%	
Recycling Quantity (lbs.)	1	0	0	0	-100.0%	

\* The larger number represents the total number of facilities that reported a PC quantity of Dioxins. The smaller number, in parenthesis, indicates the number of facilities that are the focus of this Trends Report, i.e., those facilities that reported 1 pound (rounded) or more of Dioxins that were reported as being managed via land disposal, treatment, or energy recovery. As such, the quantities shown are for the indicated smaller number of facilities.

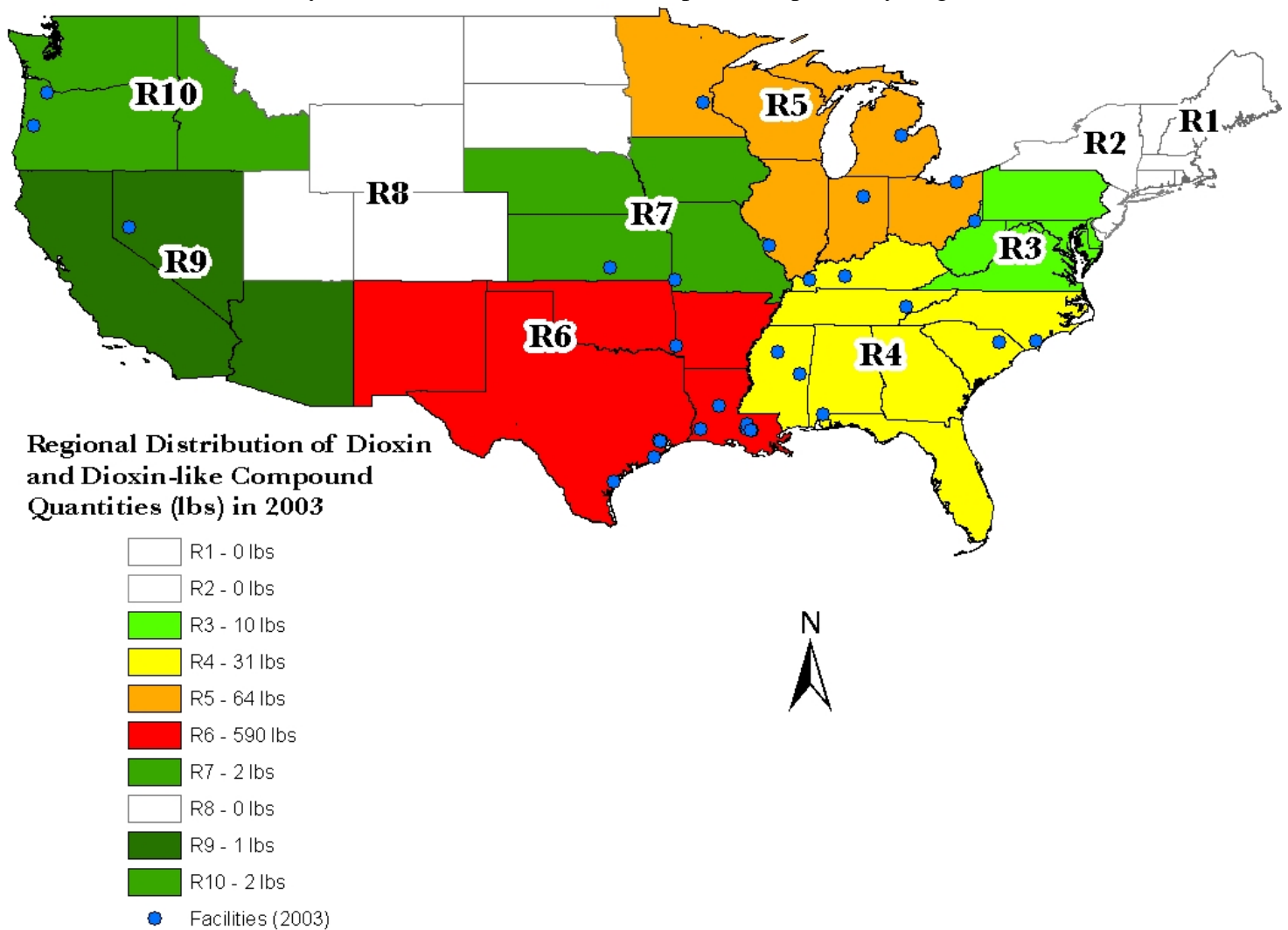
\*\* Facilities report dioxin and dioxin-like compounds to TRI in grams. The reporting threshold for dioxin and dioxin-like compounds is 0.1 grams, which is but a fraction of a pound. For the purposes of this National Trends Report, we converted the quantities to pounds and rounded to the nearest whole pound. Therefore, this Trends Report focuses only on quantities of dioxin and dioxin-like compounds that are equal to or greater than 1 pound. In making this calculation for the purpose of tracking reductions we do not intend to minimize dioxin in smaller quantities which are of considerable concern.

Exhibit 4.69 shows the number of facilities that reported dioxins within various quantity ranges. As previously noted, although 373 facilities reported dioxins in 2003, only 33 facilities, accounting for 99 percent of the dioxins reported in 2003, are represented in this Exhibit. Eight of these facilities accounted for over 89 percent of the total quantity of this chemical. One facility, noted above, accounted for over 45 percent of the total dioxins quantity reported in 2003.

Exhibit 4. 69. Distribution of Facilities that Reported Quantities for Dioxins (2003)

<b>Dioxin and dioxin-like compounds ( 700 pounds)</b>		
<b>Quantity Reported</b>	<b>Number of Facilities Reporting this quantity (2003)*</b>	<b>Percent of Total Quantity for this Priority Chemical</b>
up to 10 pounds	25	10.9%
between 11 - 100 pounds	7	44.0%
between 101 -1,000 pounds	1	45.1%
between 1,001 - 10,000 pounds	0	0.0%
between 10,001 - 100,000 pounds	0	0.0%
between 100,001 - 1 million pounds	0	0.0%
> 1 million pounds	0	0.0%

Exhibit 4. 70. Distribution of Facilities Reporting Dioxin and Dioxin-like Compounds in 2003 & Quantity of Dioxin and Dioxin-like Compounds reported by Region (2003)



*EPA Region Trends– Dioxin and dioxin-like compounds.* Exhibit 4.71 shows the quantity (pounds) of Dioxins for the EPA Regions where facilities reported this PC in 2000-2003. In 2003, over 84 percent of the dioxins were reported by facilities in Regions 6. Even discounting the anomaly quantity reported by the wood preserving facility in Louisiana facilities in Region 6 have consistently reported the largest quantity of dioxins since 2000. Several Regions’ facilities had decreased quantities, compared to the quantity reported in 2000. Facilities in Region 8 virtually eliminated dioxins in 2003, compared to the quantities reported in 2001 and 2002.

Exhibit 4. 71. Quantity of Dioxin and dioxin-like compounds Reported by EPA Regions (2000-2003)

<b>EPA Region</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>Percent Change in Quantity (2000-2003)</b>	<b>Percent of Total Priority Chemical Quantity (2003)</b>
2	28	2	0	0	-100.0%	0.0%
3	2	0	0	10	520.4%	1.5%
4	36	32	37	31	-14.9%	4.4%
5	113	143	41	64	-43.0%	9.2%
6	410	472	398	590	44.0%	84.3%
7	1	1	2	2	238.6%	0.3%
8	0	44	63	0	NA	0.0%
9	3	0	1	1	-72.4%	0.1%
10	9	4	2	2	-79.4%	0.3%
<b>Total</b>	<b>600</b>	<b>698</b>	<b>543</b>	<b>700</b>	<b>16.6%</b>	

Exhibit 4.72 shows how dioxins were managed by facilities within each EPA Region in 2003. Most of the PC quantity of dioxins was managed using offsite disposal, particularly by facilities in Region 6. Again, the “out of the ordinary” quantity of dioxins reported as sent to offsite disposal by a wood preserving facility in Louisiana had a strong influence on the total quantity reported as well as the management method used. Otherwise, prior to 2003, treatment was the primary method used to manage dioxins. No recycling of dioxins was reported in 2003.

Exhibit 4. 72. Management Methods for Dioxin and dioxin-like compounds, By EPA Region (2003)

<b>EPA Region</b>	<b>Onsite Disposal</b>	<b>Offsite Disposal</b>	<b>Onsite Energy Recovery</b>	<b>Offsite Energy Recovery</b>	<b>Onsite Treatment</b>	<b>Offsite Treatment</b>	<b>Onsite Recycling</b>	<b>Offsite Recycling</b>
3	0	0	0	0	10	0	0	0
4	1	5	0	1	6	18	0	0
5	22	1	0	0	40	1	0	0
6	51	339	0	0	162	37	0	0
7	1	0	0	1	0	0	0	0
9	0	0	0	0	0	1	0	0
10	0	0	0	0	0	2	0	0
<b>Total</b>	<b>75</b>	<b>345</b>	<b>0</b>	<b>2</b>	<b>219</b>	<b>59</b>	<b>0</b>	<b>0</b>

*State Trends– Dioxin and dioxin-like compounds.* Although facilities in 19 states reported a PC quantity of dioxins in 2003, Exhibit 4.73 only shows the quantity of dioxins, for 2000-2003, for those 3 states in which facilities reported almost 93 percent of the PC quantity of dioxins in 2003. Facilities in Louisiana reported almost 65 percent of the total quantity of dioxins in 2003. Facilities in the states of Texas and Michigan accounted for almost 28 percent of the totals quantity of dioxins, but there have been significant decreases in both these states, compared to the 2000 quantities.

Exhibit 4. 73. State-Level Information for Dioxin and dioxin-like compounds (2000-2003)

State	2000	2001	2002	2003	Change in Quantity (2000-2003)	Percent Change in Quantity (2000-2003)	Percent of Total Quantity of this Priority Chemical (2003)
Louisiana	86	128	131	453	367	424.27%	64.8%
Texas	323	344	263	134	-189	-58.54%	19.1%
Michigan	108	136	36	60	-48	-44.21%	8.6%

Exhibit 4. 14. Dioxin and Dioxin-like Compound Significant Quantity Increase and Decrease Trends (2000 – 2003): Louisiana and Texas

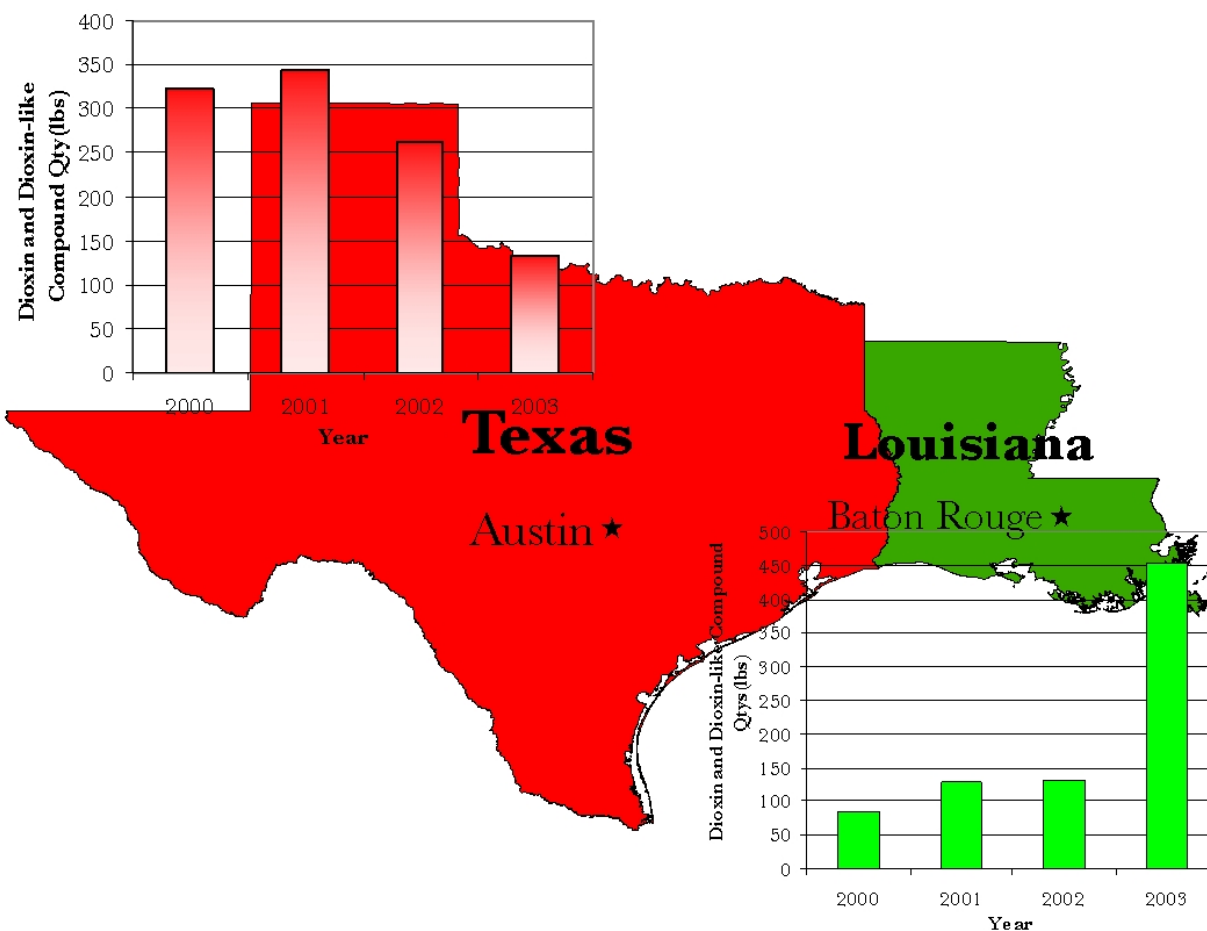


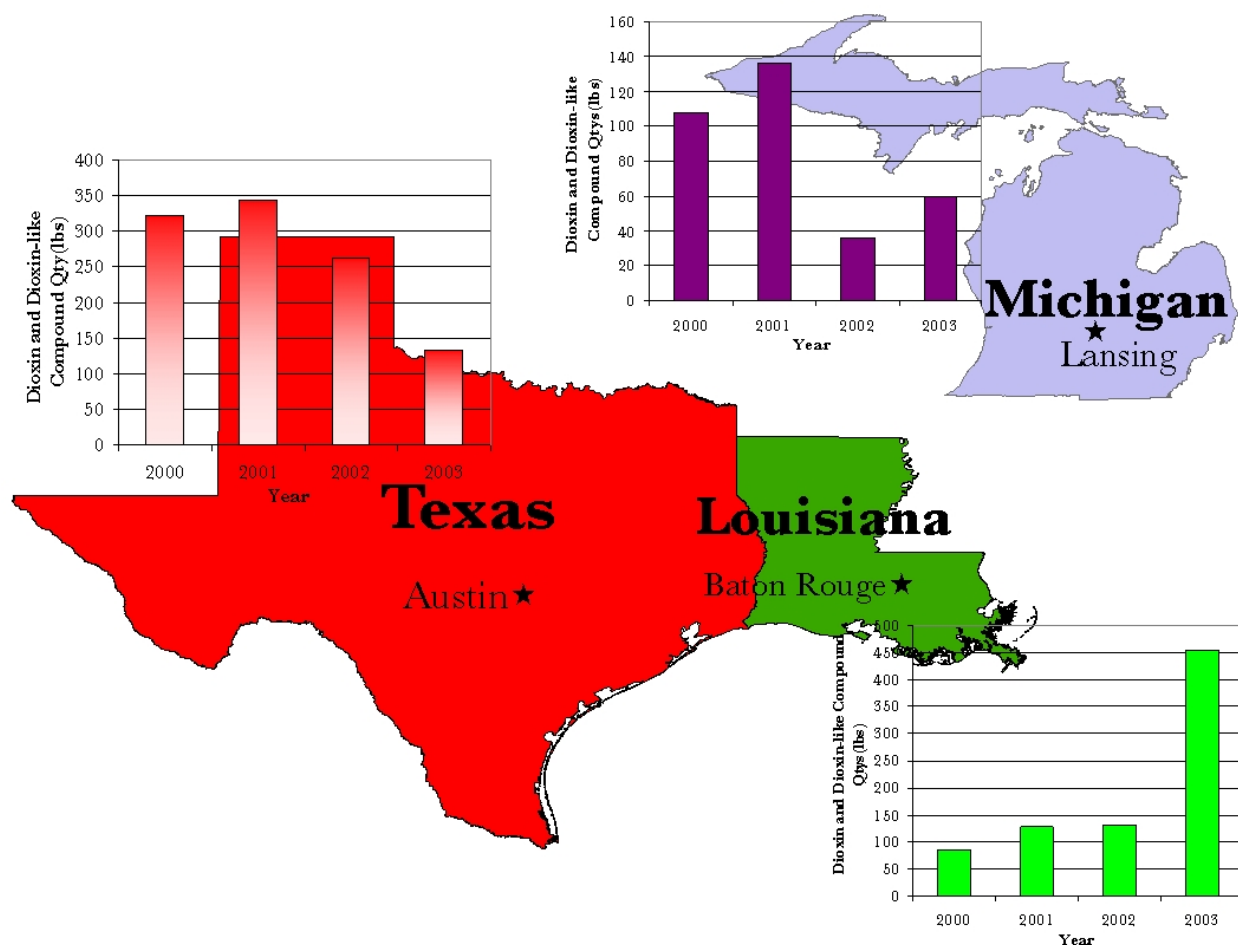
Exhibit 4.75 shows how dioxins were managed by facilities in the 3 states that had almost 93 percent of the total quantity of this PC in 2003. Most of the PC quantity of dioxins was managed using offsite disposal, particularly by facilities in Region 6. Again, the “out of the ordinary”

quantity of dioxins reported as sent to offsite disposal by a wood preserving facility in Louisiana had a strong influence on the total quantity reported as well as the management method used. Otherwise, treatment was the primary method used to manage dioxins. Recycling is not a viable alternative for dioxins; no recycling of dioxins was reported in 2003.

Exhibit 4. 75. Management of Dioxin and dioxin-like compounds in States with 93 Percent of Total Quantity (2003)

State	Total Priority Chemical Quantity (2003)	Onsite Disposal	Offsite Disposal	Onsite Energy Recovery	Offsite Energy Recovery	Onsite Treatment	Offsite Treatment	Onsite Recycling	Offsite Recycling
Louisiana	453	3	305	0	0	124	21	0	0
Texas	134	48	34	0	0	38	14	0	0
Michigan	60	22	0	0	0	38	0	0	0

Exhibit 4. 76. Trends Analysis of States Reporting Dioxin and Dioxin-like Compound Quantities



*Industry Sector (SIC) Trends—Dioxin and dioxin-like compounds.* Exhibit 4.77 shows the PC quantity (pounds) of dioxins for the 4 industry sectors (SIC codes) where facilities reported almost 95 percent of this chemical in 2003. Facilities in SIC 2491 (Wood Preserving) reported the highest quantities, accounting for almost 49 percent of the total PC quantity of dioxins reported in 2003. Most of this quantity was reported by one facility, located in Louisiana, with

almost 89 percent of the dioxins for this industry sector. This same facility, in previous years, had reported a much smaller quantity of dioxins (less than 10 pounds). Facilities in SIC 2869 (Industrial Organic chemicals, nec) have had a significant increase since 2000 of their quantity of dioxins but have consistently reported around 200 pounds in 2001-2003. The one facility reporting dioxins in SIC 2813 (Industrial Gases) reported over 200 pounds of dioxins in 2002 but then had a 69 percent decrease in quantity in 2003. Facilities in SIC 2812 (Alkalies and chlorine) also have decreased, by 87 percent, their quantity of dioxins since 2000.

Exhibit 4. 77. Industry Sector-Level Information for Dioxin and dioxin-like compounds (2000-2003)

Primary SIC Code	SIC Description	Number of Facilities for this SIC Code (2003)	2000	2001	2002	2003	Change in Quantity (2000-2003)	Percent Change (2000-2003)	Percent of Total Quantity of this Priority Chemical (2003)
2491	Wood preserving	12	28	33	36	342	314	1134.4%	48.9%
2869	Industrial organic chemicals, nec	10	84	208	184	211	127	152.2%	30.1%
2813	Industrial gases	1	0	0	207	65	65	NA	9.3%
2812	Alkalies and chlorine	3	335	350	36	45	-290	-86.7%	6.4%

Exhibit 4.78 shows how dioxins were managed by facilities in the 4 industry sectors that accounted for almost 95 percent of the total quantity of this PC in 2003. Almost 57 percent of the PC quantity of dioxins was land disposed, particularly offsite disposal by facilities in the wood preserving industry sector. Again, the “out of the ordinary” quantity of dioxins reported as sent to offsite disposal by a wood preserving facility in Louisiana had a strong influence on the total quantity reported as well as the management method used. Otherwise, treatment was the primary method used to manage dioxins. Recycling is not a viable alternative for dioxins; no recycling of dioxins was reported in 2003.

Exhibit 4. 78. Management of Dioxin and dioxin-like compounds in Industry Sectors (SIC Codes) with 95 Percent of Total Quantity (2003)

Primary SIC Code	SIC Description	Total Priority Chemical Quantity	Onsite Disposal	Offsite Disposal	Onsite Energy Recovery	Offsite Energy Recovery	Onsite Treatment	Offsite Treatment	Onsite Recycling	Offsite Recycling
2491	Wood preserving	342	0	304	0	2	0	36	0	0
2869	Industrial organic chemicals, nec	211	26	23	0	0	151	11	0	0
2813	Industrial gases	65	48	0	0	0	17	0	0	0
2812	Alkalies and chlorine	45	1	0	0	0	42	1	0	0